

U.S. and Russian spacesuits used in historic test

The Russian Orlan and American Extravehicular Mobility Unit spacesuits were used together in a manned vacuum test on March 31 in the Space Station Airlock Test Article in Bldg. 7. The SSATA is a ground-based facility used to support the International Space Station Program for airlock and extravehicular activity (EVA) hardware testing, verification/certification, and crew training. The SSATA is a man-rated, high-fidelity, 1-g airlock facility that provides flight-like simulation of airlock and EVA operations in pressures ranging from vacuum to one atmosphere.

The objective of the test was to verify that the Umbilical Interface Assembly and the Power Supply Assembly, two major pieces of the Servicing and Performance Checkout Equipment (SPCE) hardware that will support spacesuits in the space station airlock, could support both suits. The UIA is a 30-inch by 30-inch umbilical panel that allows a combination of Russian or U.S. umbilicals to attach to it for supporting the suited pre-EVA, EVA, and post-EVA umbilical operations. The PSA provides conditioned suit power to each suit.

"This test marked the first time that we've ever had a Russian spacesuit in an American facility, and it's the first time that anybody has ever conducted a manned test with two different spacesuits at the same time," said Raul Blanco, NASA manned test director in the Systems Test Branch of the Crew and Thermal Systems Division. "Everything worked extremely well. Due to the successful performance of the test hardware, the facility, and the procedures, we are now ready to begin Russian or American spacesuit testing and training of space station crews on airlock operations in this chamber."

The two suits differ significantly from each other in both design and operation, making the design of the UIA and PSA more challenging. The suits were tested simultaneously to simulate the worst possible scenario—maintaining two different suits—that the UIA and the PSA aboard the station will have to support. EVAs consisting of one U.S. and one Russian spacesuit are not planned; however, the UIA and PSA hardware can support this scenario, if necessary.

Joey Marmolejo, NASA project manager for the UIA and the PSA, was the

American spacesuit test subject, while Gennady Glazov, lead suit engineer for Zvezda, the contractor that built the Russian suit, served as the Russian subject.

Marmolejo was chosen to be the EMU suit subject because of his previous EMU experience and his thorough knowledge of the UIA and PSA.

"I'm glad that all of the planning and coordination over the last three years that we've done to pull off a test like this with participation from numerous groups including the Russian space administration, Zvezda, the ISS and shuttle programs, the



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Joey Marmolejo, left, and Gennady Glazov stand in the Crew Lock of the SSATA during a "dry run" for the first ever EMU-ORLAN manned vacuum test.



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Gennady Glazov stands in front of the Crew Lock of the SSATA.

Astronaut Office, and the EVA Project Office have finally paid off," said Marmolejo. "And, of course, I'm glad that all of the hardware, both Russian and American, performed great. This test was successful because of all the hard work that a lot of people put into it."

Glazov was very pleased with the test. "I can say that since lots and lots of time was spent in preparing for the testing, the test itself went very smoothly, and we have not encountered any issues. Everything was very successful."

Glazov found no differences between Russian and American ways of testing spacesuits. "I believe that the philosophies are very similar. I would even say that they are identical. But the organizational side is a little different. You [Americans] pay a great deal of attention to documenting everything in great detail and to the safety issues. And, of course, there's nothing bad in that. It's just that it takes a little more time."

The Orlan suit was the first one ever brought back from Mir where it was used for 13 space walks. Normally after the Russians finish using their suits, they eject them and let them burn up upon reentry in the atmosphere. But an agreement was worked out whereby this particular suit was returned by a shuttle crew specifically to undergo these tests.

Upon return from space, the ORLAN-DMA suit was delivered to Zvezda's factory just outside of Moscow, where it was tested and modified to behave like an ORLAN-M (the model that will be used on the ISS). The opportunity provided the first chance ever for the suit's designers and makers to see how an Orlan spacesuit wears after that much use in space.

After post-flight test and refurbishment, which took place about one year ago, the suit was then tested at vacuum in Russia. Both Blanco and Marmolejo traveled to Russia to witness the test to learn more about the Orlan and Zvezda's methods for suit testing. Glazov served as the test subject during this test.

A few weeks ago, an unmanned checkout was conducted on the EMU in the SSATA. More recently, the EMU was used at vacuum with Marmolejo serving as the test subject. The test verified that the SSATA and the SPCE could support the American suit.

For one week, unmanned tests were then successfully performed with and on the Orlan suit to verify the facility support systems, instrumentation, and the suit systems.

The team then had confidence that the Orlan suit and the facility were ready for a manned vacuum test. Glazov served as the test subject for a manned test, which also proved successful.

But could the SSATA and the SPCE support a manned test of both suits at the same time? Could procedures for the safe operation of simultaneous suits be developed that would allow for the different pre-breathe protocols and ambient pressure profiles? The test conducted March 31 proved that all of these objectives could be achieved.

The Systems Test Branch of the Crew and Thermal Systems Division anticipates that 30 astronauts will undergo space walk and station airlock training in the SSATA during the next year. Yet to be tested are two EMUs simultaneously, a concept that might allow for savings of both money and time.

At present, the SSATA contains the UIA, the PSA and all of the necessary interfaces to support American or Russian suits. However, within the next several months, the SSATA will also contain other key pieces of airlock and EVA support hardware including a battery charger assembly, a battery stowage assembly, and an in-flight refill unit among other items necessary to support future astronaut training. ■

Russian-American Test Team



Members of the Russian-American test team take a break during preparations for the combined EMU-ORLAN Space Station Airlock Manned Vacuum Test. Shown, from left, front, are: Joey Marmolejo; middle: Raul Blanco, Aram Elbakyan, James Chatham; back: Gennady Shchavalev, James Skipper, Ivan Tchistiyakov, Gennady Glazov.